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ABSTRACT

This paper describes the instructional design and development of a college critical reading course based on a prescriptive and systematic five-step design model derived from instructional psychology. Emphasis is on the first three steps of instructional design: instructional problem analysis, determination of instructional objectives, and determination of instructional procedures and display devices. (Author/MKM)

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APPLYING AN INSTRUCTIONAL PSYCHOLOGY MODEL TO ANALYSIS OF THE READING TASK*

Barbara Vance**

During his inaugural address as Rector of the University of Saint Andrews in 1867, John Stuart Mill said this about general education (his use of the term "men" can now be construed as a generic term referring to both men and women):

> Men are men before they are lawyers, or physicians, or merchants, or manufacturers; and if you make them capable and sensible men, they will make themselves capable and sensible lawyers or physicians. What professional men should carry away with them from a University is not professional knowledge, but that which should direct the use of their professional knowledge, and bring the light of general culture to illuminate the technicalities of a special pursuit. Men may be competent lawyers without general education, but it depends on general education to make them philosophic lawyers--who demand, and are capable of apprehending, principles, instead of merely cramming their memory with details.

Professor Gordon Craig at Stanford University adds that, "Specialization, if it begins too soon, has a narrowing effect not only upon vision, but also upon values (Craig, 1975)."

As had occurred at Stanford, administration and faculty at Brigham Young University recognized that the purpose of a university education was to prepare students to participate in and contribute to their larger society as well as to prepare them for work in specialized fields. The larger goal meant getting away from the "cafeteria style of miscellaneous

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education" in the typical general education program and providing for a more coherent program in the natural sciences, social sciences, and the humanities and fine arts. In 1972 the General Education Council was organized on campus to set policy for and supervise the formidable task of revamping the general education program to fit the broader goal of a university general education program for all students regardless of academic specialization.

At the same time the General Education Council was established, a new division was formed at the university to capitalize on the knowledge available in a new field now called instructional science. A major subdivision of this new field is called instructional psychology, a prescriptive science of instructional design based on the descriptive science of learning psychology and the latest developments in instructional technology. (Parenthetically, let me suggest that technology refers to far more than electronic hardware such as reading machines and computer-assisted instruction.) An instructional psychologist was assigned to each General Education subcommittee to assist in the development of valid instructional programs.

Five major skills areas in general education had been identified as critical in the development of a viable general education program. It was planned that all undergraduate students at the university should be able to pass tests in these basic skills areas before moving on to the more comprehensive areas of general education. Reading was considered one of these major skills areas. The other skills included writing, mathematics,

physical fitness and verbal skills. This paper describes the instructional design model used to analyze the major tasks required for critical reading skill and to develop instruction revolving around these major tasks. It was recognized by the General Education Council that critical reading ability was essential if students were to develop the capability of "apprehending...principles, instead of merely cramming their memory with details."

A Systematic Approach to Instructional Design and Development of a Critical Reading Instructional Program

The five major steps in instructional design and development and their major subdivisions are as follows:

1. Analyze the instructional problem
   - A. Determine existing conditions
   - B. Determine limitations of instructional factors
   - C. Determine needs
   - D. Determine goals
2. Determine the instructional objectives
   - A. Determine what there is to teach (identities, definitions, propositions)
   - B. Determine what should be taught (based on problem analysis)
   - C. Determine content sequence
   - D. Determine the instructional objectives

3. Determine the instructional procedures and display devices

   A. Determine the nature of the primary presentation forms (for content and for student response)

   B. Determine how to represent the primary presentation forms (mode of representation)

   C. Determine the nature of instructional helps (prompts and feedback) for the primary presentation forms.

   D. Determine implementation and management procedures

4. Develop the instructional program

5. Evaluate and revise the instructional program

   A. Conduct formative evaluation of the developing program

   B. Revise the instructional program based on formative data

   C. Conduct summative evaluation of the revised instructional program

   D. Revise the instructional program based on summative data

   E. Implement the instructional program

Before I explain each of these steps, focusing particularly on steps 2 and 3, let me define four basic concepts--"instruction," "curriculum," "learned behavior," and "instructional development." Instruction is "a specific effort by the instructor to modify the environment in such a way that specific learned behavior will result in the learner" (Vance, 1973). It is a process. Curriculum is the content or subject matter of instruction, in this case reading. Learned behavior in this context is more or less permanent, sequential behavior

change in the student resulting from training, observation and/or practice. It is the desired product of instruction. Instructional development is the systematic planning and production of those environmental elements related to the instructional objective which, when used as directed in the instructional process, will most likely lead to the desired learned behavior. The steps in instructional development described in the remainder of this paper should occur before the resulting instructional program is implemented on a broad scale in the instructional process.

STEP I: ANALYZE THE INSTRUCTIONAL PROBLEM

Too often college professors and instructional service personnel jump into instructional development without adequately analyzing the situation to find out if a real instructional problem exists and, if so, what the goals of instructional development should be based on existing conditions, limitations, and needs. Time does not allow an exhaustive description of the problem analysis that occurred relative to the reading problem at Brigham Young University. Such questions as the following had to be answered: What skills do entering students bring with them? What is the trend relative to these entering skills from year to year? What reading skills problems are most often manifest by students during their coursework at the university? What tests are presently available to assess reading skills? What reading skills are not covered by available tests? What reading skills programs are presently available for students? How efficient and effective and motivating

are these programs? How many students are affected by such programs? What equipment and materials are presently available for use in reading skills instructional programs? What new areas for reading instruction should be developed? What are the budget limitations for the development and implementation of reading skills programs?

National statistics indicate a continuing decline in verbal scores on the SAT and CAT, the two major college entrance examinations. Entering students at Brigham Young University fit these national trends each year. These declining scores have caused educators across the country to search out the causes and to suggest some remedies. Unfortunately the causes are many and inextricably intertwined. The diagnosis of a cause of a phenomenon does not necessarily suggest a prescription for its eradication. But it does alert educators to a likely instructional problem.

During the spring of 1973 a survey was conducted with BYU faculty members and students and a broad sample of members of the LDS Church in Utah, Arizona, and California (BYU is a private institution operated by the LDS Church). Among other questions, the survey asked faculty to indicate which one of four specified reading skills most daytime undergraduate students needed the greatest amount of improvement, in their opinion. Students and members outside of the university were asked a similar question except they were to answer in terms of the skill each person felt he or she needed the most improvement. The four reading skills specified on

the survey were speed, understanding and comprehension, memory and retention, and critical analysis. The results of this survey are shown in Table 1.

TABLE 1 HERE

Either speed or memory (retention) was perceived as the most critical reading need by 73 percent of the members and by 67 percent of the students. In contrast, only 10 percent of the faculty viewed one of these two skills as that most critically needed by students. Students and members were evidently reacting to the quantity of reading expected of them and to the memory load imposed by this information explosion. On the other hand, faculty do not face this problem in their roles, but are continually confronted by the seeming inability of students to come to a conceptual understanding from written discourse. The faculty viewpoint is well expressed by the written comment of one professor: "Far too many of my students cannot read to comprehend. They are surprised to find, after one has laboriously pulled them through a topic, that the text explained the matter clearly. They appear to be conditioned to gaining comprehension only through their ears."

It may be that the category of speed was interpreted in more than one way on the survey. Some students and members may have been thinking

of the Evelyn Wood type of speed reading, but others may have interpreted their own lack of fundamental decoding skills, the kind which should have been mastered in elementary school, as a speed problem. Certainly these are very different types of problems.

Unfortunately, the whole area of affect toward reading was ignored by the survey. Two faculty members commented specifically on this area. The professor quoted above wrote the following: "(Many) students have not read beyond the absolute requirements of their coursework. Relative to a university, they are close to being functionally illiterate. They are reasonably well acquainted with the mechanics of reading, but are innocent of its joy... (Many have never read even a novel except by assignment.)"

As a result of this instructional problem analysis, five major goals for the reading skills program were determined:

1. The instructional program will be cost effective. That is, the instructional program will result in no more, and hopefully less, expenditure of funds than present reading skills programs on campus.

2. The instructional program will be efficient. That is, the students in the program will learn the skills designed in the program in the same amount of time as present programs and, preferably, in less time.

3. The instructional program will be effective. That is, the students will learn what the program is designed to teach. They will accomplish the instructional objectives. Students will demonstrate skills in at least

these four basic reading skills areas: speed, memory (retention), comprehension, and critical analysis.

4. The instructional program will be motivating. That is, the students will enjoy the instruction as reflected on their evaluations of the course, in their conversations with instructors and other students, and in the amount of extra work they do voluntarily relative to the skills taught in the course.

5. The instructional program will be individualized. That is, each student may achieve the objectives of the course at his own pace and may select from the learning experiences available to him in the program those he feels will help him best achieve the objectives of the program.

STEP 2: DETERMINE THE INSTRUCTIONAL OBJECTIVES

Obviously there is no point in instructional development unless the developer knows where he is going. Goals are not enough. They are general, not specific.

When Robert Mager's (1962) booklet on behavioral objectives hit the educational community like a storm in the early 60's many educators were severe critics of the "behavioral objectives" movement. They feared such specification of learning outcomes would mechanize and dehumanize the educational process. To a degree the critics were correct. Many objectives were so trivial they could easily reduce the student to a rote memory robot if used in instruction. But just as our modern technology can produce jet aircraft far better than aircraft flown by Wilbur and Orville Wright

at Kittyhawk, so can today's instructional objectives far surpass the kind described by Mager. Instructional psychologists and subject matter specialists know far more about the instructional process and the content areas of instruction today than they did a decade ago. There are at least four tasks involved in the determination of instructional objectives.

Determine What There Is to Teach

Subject matter exists independent of the learner. We impose some form of order upon subject matter according to our educational purposes, in this case instructional objectives. This idea is relatively new in instructional development. Any given subject matter can be subdivided into identities, definitions and propositions as described in Table 2. This procedure is not the same as topical outlines. There is not space to discuss in detail the most recent work done in content analysis. The reader is referred to Merrill (1973), Merrill & Boutwell (1973), and Merrill & Gibbons (1974). However, before adequate instructional objectives can be planned in a reading skills program, the goals identified during the problem analysis step must be matched with the identities, concept definitions and propositions in the various areas of reading skills content (i.e., understanding and comprehension, speed, memory (retention), and critical analysis). Each of these areas can be divided into hierarchies and heterarchies of identities, definitions, and/or propositions related to a given cultural expectation.

TABLE 2 HERE

Let me point out that this stage of instructional development is the most time-consuming and perhaps the most difficult of all the steps in instructional development. This step in our analysis of reading skills content went through many phases, trial-and-error analysis, and dead-end streets. Subject matter experts are accustomed to viewing the structure of any given content area of the curriculum in terms of topics and outlines. But a broader vision and framework for the content structure is required. Just as the architect must depend upon engineering specialists in the various types of building materials and equipment to tell him what is available with which to design the buildings, so must the instructional psychologist depend upon subject-matter experts, in this case reading skills specialists, to tell him/her what basic content is available with which to design instruction. But few subject-matter experts agree on basic content in any academic field. My colleagues on this symposium today were the subject-matter experts on this reading program. Each could tell and write volumes about his or her experience during this phase of instructional development. As in politics, compromise was necessary and did occur. The difficulty of this step is geometrically increased with the addition of each new subject-matter expert to the development team. The type of instructional development described

herein is not recommended for those who are interested in building their own little academic kingdoms!

Determine What Should Be Taught

The list of identities, definitions, and propositions derived from the previous list was too long in the development of the reading skills program. It generally is in any content area. During this stage of instructional development a decision must be made by the subject-matter experts, in consultation with the instructional psychologist, about what should be taught. Generally this decision is based on the content goals outlined during the problem analysis. The decision was based on the answers to the following questions: What reading skills are most needed by students at the university? What concepts and/or identitites must each student know before he can demonstrate any given skill? This is not a once-and-for-all decision. That is, often in later stages of instructional development changes will be made in content as a result of insights gained farther down the instructional development road. But the basic decisions about what should be taught should be made at this stage in instructional development. The following list of skills areas was determined for the reading course during this stage of development: levels of generality, fact vs. opinion, descriptive relationships, cause-effect relationships, premise-conclusion relationships, memory skills: recognition and recall, interpreting graphic data, and skimming and scanning: speed reading. Concepts and propositions relative to each of these skills areas

were identified. No identities were identified for the course inasmuch as they were not considered essential to any of the skills areas in reading. Before instructional development was completed for trial with students during fall semester of 1975 this list of skills areas together with related concepts and propositions was slightly modified. This modified list appears in Table 3. It was decided that no real hierarchy of content existed relative to these reading skills. That is, it doesn't matter in which order the reading skills are studied.

TABLE 3 HERE

Determine Content Sequence

What concepts (definitions) must be learned before other concepts can be learned? What concepts must be learned before specific propositions can be learned? Are there any identities that must be learned before particular concepts or propositions can be learned? The answers to these questions involve the process of sequencing instruction.

There are no hard and fast rules for the optimal sequence of content in any given subject matter. There is not enough information available yet from research with human information processing to provide fool-proof rules. The subject matter expert's and instructional psychologist's common sense and observed data from students can provide clues for the most desirable

instruction. Sometimes it doesn't really matter in which order the content is presented. During this step of instructional development of the reading skills program it was determined that no best sequence was desirable. That is, each major skills area could be studied independently of any other skills area, and there generally was no hierarchy of concepts or propositions to be learned in any given skills area. A recommended order was determined for the instructional program, beginning with levels of generality. However, such a sequence is only a recommendation, not a learning necessity.

Determine the Instructional Objectives

When identities, definitions, and propositions in each curriculum content area have been identified, the next step is to translate these into instructional objectives that are specific and measurable. It is at this point where behaviorally stated objectives become important in the instructional planning process. But it is precisely at this point where criticism can be leveled at many, if not most, instructional objectives in higher education. It is here that objectives can become trivial.

A few years ago one of my colleagues spent several weeks planning behavioral objectives for a psychology course. He arrived at the stupendous number of 5,257 objectives for a one-semester three-unit course! You probably have heard of fellow educators spending their time at workshops before school starts in the fall or even during the school year grinding out behavioral objectives for various content areas of the curriculum. Just

as with my colleague, you will find that most of these objectives begin with "be able to name...," "be able to tell...," "be able to identify...," "be able to state," and so on. In other words, our colleagues have been caught in a trap where they are limited to observable behaviors which are usually low-level memory behaviors (i.e., name, tell, list, identify, state). They say to themselves, "Certainly there must be more to objectives than this." And there certainly is. Consider the fact that knowledge is doubling about every five years at the present rate. Thus, it is impossible to teach the student all the information there is to know in a given content area--or even that he needs to know to cope in the world. Our responsibility, then, is to plan most objectives where the student will "learn how to learn" so that he can meet each new challenge or problem and find his own best solution when no one is there to show him what to do. What I am suggesting is that we should emphasize objectives that require transfer behavior or, in other words, classification, rule-using, and rule-finding objectives described in Table 4. Once the decision is made as to what concepts and propositions a student must learn in order to achieve the goals of a given content area of instruction, it is a relatively simple process to generate classification, rule-using, and rule-finding objectives. That is, if we can determine the basic content related to any given area of the curriculum, objectives can be determined to fit the model for any given type of behavior. There is a discrete set of characteristics of objectives for each type or level of behavior,

including memory behavior, classification behavior, rule-using behavior, and rule-finding behavior (see Table 4).[1]

TABLE 4 HERE

The instructional objectives in the reading skills program generally fit either the classification or the rule-using category. That is, each objective is designed to measure the student's ability to transfer what he has learned to previously unencountered instances of a given concept or proposition. Only 18 instructional objectives were determined for the course to fit the eight skills areas identified in the reading content area of the general education curriculum (see Table 3). Table 5 is a list of these 18 instructional objectives. This is a distinct contrast with the proliferation of trivial memory objectives in the typical college course. How instruction was designed to teach these 18 instructional objectives in the reading course is the subject of the next step of instructional design and development.

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[1] Affective instructional objectives have been deleted from this paper on purpose. Affect is considered primarily a function of the entire instructional process. Affective instructional objectives are usually extremely difficult to measure.

TABLE 5 HERE

STEP 3: DETERMINE THE INSTRUCTIONAL PROCEDURES AND DISPLAY DEVICES

Inasmuch as the term "instruction" refers to the procedures intended to bring about specific behavior in the learner, it is important that the instructional procedures and resultant materials be determined according to the nature of the objective. Too often procedures and materials for instruction are planned to "entertain" or to "motivate" the student rather than to "teach" the student something specific. Instructional procedures and materials can be motivating at the same time they are effectively assisting the student to accomplish a given objective.

There are four basic tasks for the instructional psychologist and subject-matter experts during this step of instructional design. These tasks, when completed, result in the basic plans and specifications for any given instructional program. The first task is to determine the primary presentation forms for content and for expected student responses. The second task is to determine the modes of representation for the primary presentation forms. The third task is to determine the instructional helps for the primary presentation forms. The fourth task is to determine implementation and management procedures.

Knowing the basic mode or modes of delivery desirable for any given instructional program is necessary before this step can be accomplished.

Two basic delivery systems had been planned for the reading skills course. One was the computer-assisted instructional delivery system of TICCIT which will be explained by one of my colleagues later. The other was a combination of student lab manual/home-study text that could be used by students either in a regular on-campus class setting or off-campus in the student's home.

Determine the Nature of the Primary Presentation Forms

Effective instruction for any given identity, definition, or proposition must include three basic primary presentation display forms and one basic evaluation display form. That is, instruction for any given identity, definition, or proposition includes a statement of the rule for that content, several worked example instances, several practice instances, and several test instances of the rule.

Any given concept or proposition (content) can be represented during instruction either as a generality (rule) or as an instance or example of the generality. A generality (G) is a definition of a concept, including its critical attributes, or a propositional statement of steps or procedures. An instance or example (eg) is a presentation of a referent (actual object, person, place, or event or a high-fidelity representation of the referent) representing the concept or the proposition. Identities have only one member of a set. Any given identity is the one and only example of that identity. Therefore, there is no generality presentation for an identity and only one example.

The response mode refers to what the student is expected to do with the generality or instance. There are two modes, expository (meaning "to tell") and inquisitory (meaning "to ask"). In expository mode (E), the student is not expected to make a response to what is displayed but, rather, is expected to attend to the instructional display with one or more of his senses in preparation for a later response. In inquisitory mode (I), the student is expected to make some type of overt response to the instructional display such as pointing to something, writing something, verbally responding, and so on. Figure 1 illustrates how primary presentation modes interact. The backbone of any instructional strategy is this relationship among primary presentation modes.

Figure 1

Primary Presentation Forms

CONTENT MODE

(What is Presented)

RESPONSE MODE (How it is Presented)		G	eg
	E	EG "Rule"	Eeg "Example"
	I	IG "Recall"	Ieg "Practice"

The ~~caps~~ columns in Table 6 reflect the relationship among these primary presentation modes. Column 1, Rule (Generality), means that the content mode

will be a generality and the response mode will be expository (that is, the student is expected to attend to the instructional display rather than make an overt response to the instructional display). The symbol EG represents this expository generality relationship form. Column 2, Example, means that the content mode will be an instance rather than a generality and that the response mode is expository. The symbol Eeg represents this expository instance relationship form. Column 3, Practice, means again that the content mode will be an instance rather than a generality, and that the content mode is inquisitory (that is, the student is expected to make a specified overt response to the instructional display). The symbol Ieg represents this inquisitory instance relationship form. Column 4, Test, has the same symbol, Ieg, as Column 3, Practice. This suggests that test items should be presented in the same form as practice items. Test items, however, are administered separate from instruction even though they should be developed at the same time the other three primary presentation forms are developed.

TABLE 6 HERE

The items in the first ~~caps~~ column of the checklist in Table 6 relate to guidelines for preparing the primary presentation forms. There is not time to elaborate on all of the guidelines in this Primary Presentation Form row. However, a few items need elaboration.

The model of instructional design and development used to develop the reading course emphasizes instances that demonstrate a given rule (generality). Three of the four columns on the checklist (Table 6) relate to instances of the rule, not the rule itself (that is, Example in Column 2, Practice in Column 3, and Test in Column 4). There generally is no correlation between the student's ability to state the definition of a concept or the steps or procedures involved in a proposition (the IG or "Recall" box in Figure 1) and his ability to identify previously unencountered instances of the concept (definition) or to apply a set of steps or procedures in a proposition to previously unencountered conditions (the leg or "practice" box in Figure 1 and Columns 3 and 4, Practice and Test, in Table 6). That is, just because a student can give the correct definition of metaphor does not mean he would recognize one in a passage if he saw one. Just because a student can write the correct steps to follow in mapping a passage when speed reading does not mean he would demonstrate those same steps when speed reading a passage. Therefore, there is no inquisitory generality (IG) primary presentation form used in the model of instructional design suggested in this paper. Unfortunately, much, if not most, evaluation in formal schooling includes inquisitory test items. Generally such items are unnecessary for effective instruction to be developed.

Items 2.1.2., 3.1.2., and 4.1.2. on the Checklist in Table 6 suggest that instances used in instruction should be in the same form as that specified

by the objective. The objective is essentially a description of the test items to be used for evaluation of the effectiveness of the instruction. Therefore, primary instruction in this course consists of example and practice items similar in form to the test items. All three primary presentation forms should be in the form suggested by the objective.

Items 3.1.3. and 4.1.3. on the Checklist in Table 6 suggest that practice and test items should be different from those used for examples. That is, each time a student encounters an instance, whether as an example item, a practice item, or a test item, it should be one he has not encountered before during the instruction. Herein lies a major challenge to subject-matter authors in instructional development. Determining the rule (generality) for a given concept or proposition is relatively easy compared to collecting and generating instance items for Example, Practice, and Test modes. Typical instruction generally is example poor. The model of instructional design used for the reading course requires an example-rich form of instruction.

Related to the generation of instance item pools is the idea that a student cannot determine whether a given instance is an example of a given concept unless he also knows what that concept is not. This is why item 2.1.3. on the Checklist in Table 6 suggests that, when the focus of instruction is a concept (definition content), each example should be matched with a nonexample that has similar irrelevant characteristics.

Further explication of the Checklist items in the first row of Table 6 can be found in Merrill and Wood (1975).

The four primary presentation forms (rule, example, practice, test) are illustrated in Appendix A relative to a fact vs. opinion lesson in the home study manual of the reading skills course.

Determine How to Represent the Primary Presentation Forms

Once the primary presentation forms for a given instructional objective have been determined the instructional psychologist must decide how each of these modes will be represented in instruction. Are you going to use the lecture method, films, videotapes, overhead transparencies, individualized instruction booklets, the discussion method, or some other mode of representation? And how will you expect the student to respond to these modes of representation? Your instructional objective will suggest your mode of representation. The basic decisions about mode of representation had already been made on the reading course before the instructional psychologist entered the developmental phase--the TICCIT CAI system at Brigham Young University and student lab manuals/home study texts.

The instructional display mode is the mode in which the instruction will be represented for the student to observe and respond to. There are four such modes: firsthand, vicarious, secondary, and symbolic. CAI systems combine secondary and symbolic modes. Manuals and texts are basically symbolic instructional display modes of representation.

The response mode of representation is the type of response expected from the student relative to the instructional display. There are three types of response modes of representation: enactive, iconic, and symbolic. The responses in a reading course involve reading and writing or checking items, which are basically symbolic response modes of representation.

Determine the Nature of Instructional Helps (Prompts and Feedback) for the Primary Presentation Forms

Instructional procedures are not complete until instructional aids are provided to assist the student in achieving a given objective. These aids help the student process content information during instruction. Rothkopf (1965) has coined the phrase, "mathemagenic information," to refer to such aids or instructional helps. When such information is provided the student before he responds to an inquisitory display it is called prompting. This means calling the attention of the student to salient features of a display, not giving him the desired response. There are four basic types of prompting: mnemonic, attribute isolation, algorithm, and heuristic. Such prompts are used in rule and example displays (columns 1 and 2, row 3, Table 6).

In contrast to prompting, feedback is the information provided the student following a response to an inquisitory (practice) display. There are four basic types of feedback useful for instruction: right/wrong knowledge of results, correct answer knowledge of results, attribute isolation, and algorithm.

Examples of various kinds of prompts and feedback are noted in the instructional segment on fact vs. opinion in Appendix A.

Determine Implementation and Management Procedures

The most effective instructional program can fall flat on its face once it is implemented unless part of the instructional planning process includes how to implement and manage the course. Such questions as these must be answered: How will the student receive individualized instructor help when he needs it? How will the student receive immediate feedback regarding his progress in the course? When will the student enter and exit the course? How can the student go at his own pace without complicating the record-keeping system? How will the student be graded? How will the student know what areas he should emphasize for study? What is the role of the instructor, if not the prime source of course information? How will the student be tested?

Before production of lesson materials was begun for the reading course a separate management and implementation document was prepared by the instructional psychologist for the CAI-TICCIT course for on-campus students and for the home-study course for off-campus students. Appendix B shows the flowchart for an on-campus student in the reading program. Appendix C shows the flowchart for home-study students. Each flowchart was described in detail in its separate document. These documents were used to guide the production as well as the implementation of the reading skills program. Some modifications of original document plans were necessary as the course was introduced for trial with students during fall semester of 1975.

STEP 4: DEVELOP THE INSTRUCTIONAL PROGRAM

STEP 5: EVALUATE AND REVISE INSTRUCTIONAL PROGRAMS

Members of the instructional production team, generally graduate and honors undergraduate students in English, prepared the sample, example, practice, and test items for the lesson specifications once the subject-matter experts completed the statements of objective and rule (generality) for each lesson segment. These specifications were checked by the instructional psychologist on the project for adherence to guidelines on the Checklist in Table 6. Complete lessons were then produced for trial by the production teams.

The first trial of the course was implemented during fall semester 1975 with a few study skills classes at BYU. Some revisions were made in the instructional program before additional trial of the course during winter semester of 1976. Results of these trials will be described later by my colleagues.

Summary

This paper has described the instructional design and development of a college critical reading course based on a prescriptive and systematic five-step instructional design model. Emphasis has been on the first three steps of instructional design--instructional problem analysis, determination of instructional objectives, and determination of instructional procedures and display devices.

References

Craig, Gordon. Green Stamp or structured undergraduate education? The Stanford Observer, April 1975.

Mager, R. T. Preparing instructional objectives. Palo Alto, Calif.: Fearon Publishers, 1962.

Merrill, M. D. Content and instructional analysis for cognitive transfer tasks. Audio Visual Communication Review, 1973, 21, No. 1, 109-125.

Merrill, M. D. & Boutwell, R. C. Instructional development: Methodology and research. In F. N. Kerlinger (Ed.), Review of research in education. (Vol. 1). Itasca, Ill.: Peacock Publishers, 1973.

Merrill, M. D. & Gibbons, A. S. Heterarchies and their relationship to behavioral hierarchies for sequencing content in instruction. Paper presented at the Amrican Educational Research Association convention, Chicago, April, 1974.

Merrill, M. D. & Wood, N. D. Instructional strategies: A preliminary taxonomy. Technical Report No. 1R, Courseware, Inc., Orem, Utah, July 1975.

Rothkopf, E. A. Some theoretical and experimental approaches to problems in written instruction. In J. D. Krumboltz (Ed.), Learning and the education process. Chicago: Rand McNally, 1965.

Table 1

Percent of Survey Respondents in Three Categories Who Felt a Given Reading Skill Needed the Most Improvement, BYU General Education Survey, Spring 1972

READING SKILL	TYPE OF RESPONDENTS		
	Members with Some College Background (N=498)	Students (N=593)	Faculty (N=446)
Speed	38	44	6
Understanding, Comprehension	13	16	39
Memory, Retention	35	26	4
Critical Analysis	14	17	51

Table 3

Reading Skills Areas and Titles of Major Subdivisions of Concepts and Propositions

LEVELS OF GENERALITY

- Basic Levels of Generality
- Levels of Generality in Paragraphs
- Levels of Generality in Essays

STUDY SKILLS

- Textbook

FACT vs. OPINION

FIGURATIVE LANGUAGE

- Simile
- Metaphor
- Basic Tone
- Irony

CONCEPT-EXAMPLE RELATIONSHIPS

- Finding the Example
- Contrast

CAUSE-EFFECT

- Evaluating Cause-Effect Relationships

PREMISE-CONCLUSION

- Evaluating Conclusions

Identifying Unstated Assumptions

Logical Conditions

Suspending Bias

SPEED READING

Basic Hand Movement and Drill

Mapping

Table 2

Cognitive Components of Subject-Matter Areas of the Curriculum

---

Component: Identity

Definition: An object, symbol, or event that is associated on a one-to-one basis with anothe object, symbol, or event.

Examples:

1. Names of specific people, places, objects, or events
2. Mathematics symbols (e.g., +, -, =, x, -)
3. Letters of the alphabet
4. Words in any language

Component: Definition (of a concept)

Definition: A statement describing the one or more common attributes (characteristics) shared by a group of objects, people, places, or events (referents).

Examples:

1. A fact is (a) a statement of an event or condition that has already occurred, or (b) a statement of a truth that has been verified (tested and proven true) by experience or observation.
2. An opinion supported by stated fact is a conclusion that follows logically from and is supported by facts that are stated in the passage.
3. An unsupported opinion is a statement about something the writer believes, thinks, or feels, without the reasons for the belief being stated in the passage.

Component: Proposition

Definition: A statement describing the combination operation or operations (steps or procedures) necessary to produce a given qualitative change in given conditions.

Example:

(From speed reading lesson) To map an idea you should follow these four steps:

1. Using your hand as a pacer, read through the material. Go as fast as you can understand the passage. Read for what the author is SAYING. This means:

a. Go slow on parts you don't understand.
b. Speed up on easier parts.

2. When you have finished, go over the material at a very fast rate (over 800 or 900 words per minute) to pull the ideas together. This time, read for what the author is DOING, or what is HAPPENING. This means you should:
   a. Ask yourself constantly, "What is the author doing here?" or "What is happening here?"
   b. Answer yourself, talking out loud until you get the hang of it.

3. Draw a map of the ideas in the passage. To do this, diagram what the author is doing. You should draw a diagram that will be helpful to you. Several different diagrams could each be "correct." Don't spend a lot of time on this part. You should be able to do it quickly.

4. Ask yourself questions about each part of the diagram. If you don't know the answer, review just that part of the passage.

Table 4

Types of Cognitive Instructional Objectives

Type: Memory

Definition of Student Response: Recalling or recognizing a specific stimulus or set of stimuli (object, person, place, or event) previously encountered without prompting or hesitation.

Examples of Memory Objectives:

1. Correctly name the critical characteristics of a fact, an opinion supported by stated fact, and an unsupported opinion.
2. Correctly name in chronological order the steps involved in mapping when a person is speed reading.

Type: Classification

Definition of Student Response: Identifying the class membership (category) of a previously unencountered object, person, place, or event or its representation.

Examples of Classification Objectives:

1. Given a passage, identify whether it is a statement of fact, an opinion supported by stated fact, or unsupported opinion.
2. Given a list of words, choose the levels of generality diagram that fits the list.
3. Given a passage, identify whether it contains a valid cause-effect relationship, a cause-effect relationship that doesn't have enough evidence to support it, or a relationship that is not cause-effect at all.

Type: Rule Using

Definition of Student Response: Producing the desired result or change when given previously unencountered instances of two or more conditions and processes for achieving the desired results with the given conditions.

Examples of Rule-Using Objectives:

1. Given an essay, find the level one sentence or controlling statement. Then outline that essay using a level of generality diagram.
2. Given a passage of any length, map the passage so that all the important ideas and concepts in the passage appear on the map.

Type: Rule Finding

Definition of Student Response: Finding or inventing one or more rules or procedures that will complete an ordered relationship between or among previously unencountered conditions and a desired outcome.

Example of Rule-Finding Objective:

Given a passage, devise your own method of outlining the passage to quickly and specifically show the most important concepts and principles in the passage and how they are related.

Table 5

Instructional Objectives for the
Critical Reading Course at
Brigham Young University

LEVELS OF GENERALITY

Basic Levels of Generality--Given a list of words, choose the levels of generality diagram that fits the list.

Levels of Generality in Paragraphs--Given a paragraph, underline the topic sentence, choose the levels of generality pattern that correctly diagrams the paragraph, and choose the correct relationship between two designated sentences.

Levels of Generality in Essays--Given an essay, find the level one sentence or controlling statement. Then outline that essay using a levels of generality diagram.

STUDY SKILLS

How to Study Textbooks--Given a passage from a textbook, use the PARCER study method to answer the questions following the passage.

FACT vs. OPINION

Fact vs. Opinion--Tell whether a given statement is fact, opinion supported by stated fact, or unsupported opinion.

FIGURATIVE LANGUAGE

Simile--Given a passage containing a simile, identify the items being compared with each other in the simile and tell what characteristics are shared by those items.

Metaphor--Given a passage focusing on a metaphor, identify the meaning or feeling implied by the metaphor.

Understanding Tone--Given a collection of phrases and a passage in which they are used, choose from a variety of statements the one which best expresses the tone of the collection of phrases.

Irony--Given a passage, decide whether or not it is written in ironic tone and, if it is, identify the purpose of the irony.

CONCEPT-EXAMPLE RELATIONSHIPS

Finding the Example--Given a concept with a list of its critical characteristics, and given one case, determine whether the case is an example of the concept.

Contrast--Given a passage that contains contrast relationships, identify (1) the contrast relationship, (2) the items being contrasted, and (3) the meaning developed by the contrast.

CAUSE-EFFECT

Evaluating Cause-Effect Relationships--Given a passage, identify whether it contains a valid cause-effect relationship, a cause-effect relationship that doesn't have enough evidence to support it, or a relationship that is not cause-effect at all.

PREMISE-CONCLUSION

Evaluating Conclusions--Given a passage with the conclusion identified, determine whether or not the conclusion is supported by the evidence in the passage.

Identifying Unstated Assumptions--Given a passage containing evidence and an unsupported or partially supported conclusion, identify from a list of alternatives the unstated assumption which would make the conclusion valid.

Logical Conditions--Given a proposition and a list of conditions, identify whether a condition is compatible, related, incompatible, or unrelated.

Suspending Bias--Given a series of propositions, select the one that you disagree with the most. Then choose from 10 statements the two which logically support the proposition you disagree with.

SPEED READING

Basic Hand Movement and Drill--Given a reading assignment, be able to use your hand as a pacer to establish a smooth, rhythmic reading rate, and increase your reading speed.

Mapping--Be able to map a passage so that you can see the important ideas and how they relate to each other.

CONTENT: Identity ___
Definition ___
Proposition ___

Table 6
INSTRUCTIONAL STRATEGY DESIGN CHECKLIST (ISDC)*

TASK: Memory
Classification ___
Rule Using ___
Rule Finding ___

INSTRUCTIONAL STRATEGY VARIABLE	PRIMARY PRESENTATION FORM			
	RULE (Generality) (EG) 1	EXAMPLE (Eeg) 2	PRACTICE (leg) 3	TEST (leg) 4
PRIMARY PRESENTATION FORM 1	1.1.1. The rule for the content in the objective is explicit, concise, and complete. If a definition: (a) the concept is named; (b) each of the critical attributes of referents of the concept is stated. If a proposition: (a) the desired result is identified; (this usually is the name of the proposition) (b) the operations (steps, procedures) to achieve the desired result are stated explicitly, and in chronological order (if order is critical); (c) there is an explicit statement of the conditions in which the operations of the proposition should be applied.	2.1.1. Instances are specific objects, people, places, events, or their representations. 2.1.2. Instances are in the form specified by the objective. 2.1.3. (If definition content) Each example is matched with a nonexample that has similar irrelevant characteristics. 2.1.4. Each instance is divergent from subsequent instances. 2.1.5. There is at least one minimum critical subset of instances. 2.1.6. Instances range from easy to hard. 2.1.7. Example instances are clearly identified and isolated from other primary presentation forms.	3.1.1. (Same as 2.1.1.) 3.1.2. (Same as 2.1.2.) 3.1.3. Each practice instance is different from any other example or test instance. 3.1.4. (Same as 2.1.4.) 3.1.5. (Same as 2.1.5.) 3.1.6. (Same as 2.1.6.) 3.1.7. Practice instances are clearly identified and isolated from other primary presentation forms. 3.1.8. There are at least as many practice instances as test instances.	4.1.1. (Same as 2.1.1.) 4.1.2. (Same as 2.1.2.) 4.1.3. Each test instance is different from any other example or practice instance. 4.1.4. (Same as 2.1.4.) 4.1.5. (Same as 2.1.5.) 4.1.6. (Same as 2.1.6.) 4.1.7. Test items are separate from instruction. 4.1.8. Test items are randomly sequenced.

*Adapted from Merrill, M. D. & Wood, N. D. Rules for effective Instructional strategies. Instructional Design Series, Courseware, Inc., Orem, Utah, 1975.

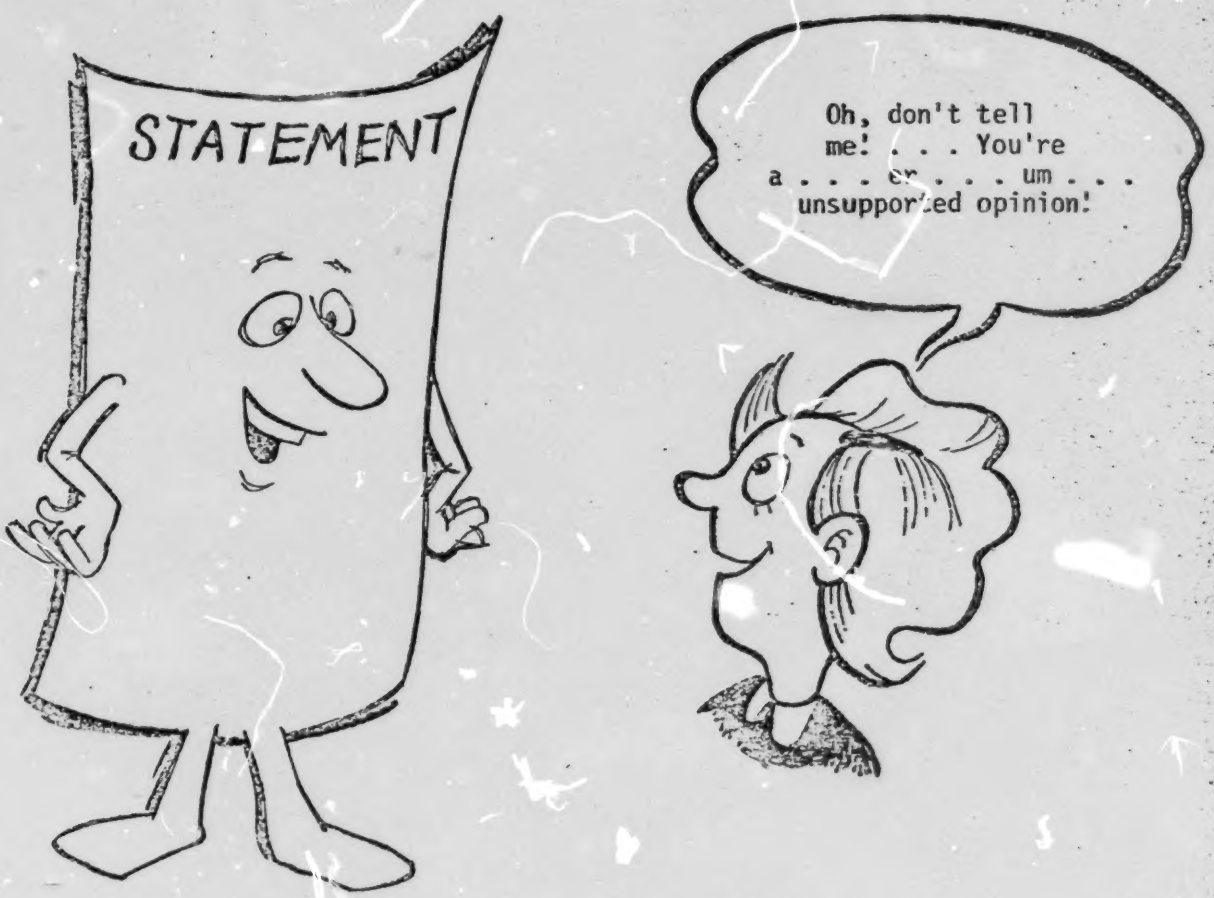
INSTRUCTIONAL STRATEGY VARIABLE	PRIMARY PRESENTATION FORM			
	RULE (Generality) (EG)[1]	EXAMPLE (Eeg)[2]	PRACTICE (leg)[3]	TEST (leg)[4]
PRIMARY PRESENTATION FORM[1] (cont'd)	1.1.2. The rule (generality) is clearly identified and isolated from other primary presentation forms.		3.1.9. (If definition content) Early practice instances are matched with their nonexamples while later instances are not.	
MODE OF REPRESENTATION[2]	1.2.1. The mode of representation for the rule is directly related to the test and that suggested in the objective.	2.2.1. The mode of representation for example is the same as that used for practice and test instances.	3.2.1. The mode of representation for practice instances is the same as that used for example and practice instances.	4.2.1. The mode of representation for test instances is the same as that specified in the objective.
INSTRUCTIONAL HELP[3]	1.3.1. The elaboration of the rule (generality) includes some algorithmic and/or mnemonic prompts.	2.3.1. Each instance is accompanied by appropriate instructional prompts (attribute isolation if content is a definition; algorithm if content is a proposition).	3.3.1. Each instance is accompanied by appropriate instructional feedback (attribute isolation if content is a definition; algorithm if content is a proposition) as well as correct-answer knowledge of results.	4.3.1. Each test item is free of before-response instructional prompts. 4.3.2. Each test item is free of after-response feedback.

Appendix A

Segment 1 - Fact vs. Opinion

OBJECTIVE:

Tell whether a given statement is fact, opinion supported by stated fact, or unsupported opinion.



SEGMENT 1 - FACT VS. OPINION

PURPOSE

Many readers believe any statement they read. This lesson will help you realize that there are many kinds of statements. Some are facts, some are well-supported opinions, and some are just opinions. Knowing what kind of statement you are dealing with should make you a more critical reader.

RULE

EG (Generality)

1) A fact is:

a) a statement of an event or condition that has already occurred.

example -- Scott achieved a 3.0 grade point average last semester.

b) a statement of a truth that has been verified (tested and proven true) by experience or observation. (Universal laws fit this category.)

example -- The volume of a given quantity of a gas is dependent on temperature and pressure.

2) An opinion supported by stated fact is:

a) a conclusion that follows logically from and is supported by facts that are stated in the passage. (For now, assume that all conclusions follow logically from the facts presented. You will be taught more about logical conclusions later.)

example -- John knows more about animals than I do. He is a licensed veterinarian. I don't like animals and so I've never studied them.

3) An unsupported opinion is:

a) a statement about something the writer believes, thinks, or feels, without the reasons for the belief being stated in the passage. There are at least three types of unsupported opinions.

1) Unsupported opinions based on experiences or events that both the reader and writer understand and accept.

example -- Boston is expected to have its hottest day of the year tomorrow, continuing the heat wave that is now a week old.

2) Unsupported opinions by a writer who is an authority in his field.

example -- Solzhenitsyn thinks U.S.-Soviet detente is doomed.

3) Unsupported opinions which fall in the realm of gossip, or prejudice. These statements are usually not valuable or acceptable.

example -- I heard he was drunk last night.

Rule Elaboration

It is up to you, the reader, to determine whether or not you will accept any of these statements. Your experience may cause you to question a factual statement and want to verify it yourself. Many important contributions to science have come to light because of a question about something taught as fact.

On the other hand, important decisions have been made just because something "felt" right, even though it was not supported by the factual evidence at hand.

If we had all knowledge we could tell you what statements to accept or reject. Since we don't, we will simply ask you to classify a statement, not judge it.

SEGMENT 1 - FACT VS. OPINION

Eeg EXAMPLE

Task: Tell whether a statement is fact, opinion supported by fact, or unsupported opinion.

How to do it:

Ask yourself these questions:

1. Does this statement tell about something that has already happened?

   or

2. Can the truth of this statement be verified by experience or scientific observation?

Algorithm Prompt

If the answer to either of these questions is "yes," the statement is a fact.

If the answer is "no" to both questions, go on.

3. Is the opinion supported by fact stated in the passage?

If the answer is "yes," the statement is supported opinion.

If the answer is "no" the statement is unsupported opinion.

As a reader, you always need to be aware of unsupported opinion. Whether or not you accept it depends upon whether or not you:

1. have had experiences which support the opinion

   or

2. believe the opinion is stated by someone who is an authority in his field. (Someone who obviously knows what he is talking about.)

You ought to reject those statements of unsupported opinion which sound like gossip or prejudice.

Examples

Attrib, Isolation Prompt

This statement is a fact because it tells of something that has happened.

eg Houston had its hottest day of the year Tuesday when the mercury climbed to 99° F.

Attrib, Isol,

The next statement is a fact because it states a condition that has been verified by experience or observation.

SEGMENT 1 - FACT VS. OPINION

Iag

PRACTICE ITEMS

Classify each of the following underlined statements as fact, supported opinion, or unsupported opinion.

1. _____

President John F. Kennedy held but one meeting on the Presidential politics of 1964 -- on Tuesday, November 12th, 1963, ten days before his death. It lasted three full hours and was held in the Cabinet room in late afternoon, and, by the account of those present, was more an amusement or a matter of mischievous administration for him than a matter of high concern, as such meetings had been in 1959 and 1960. (Theodore H. White, The Making of the President 1964, p. 42.)

2. _____

The grass is always greener on the other side of the fence. The higher the fence is, the greener the grass will be.

3. _____

Utah is a "motorcycle state." Of the 50 states, Utah sits among the top three as having the most motorcycle registrations per capita -- 50,000. Pick a path or type of riding and you'll find it in Utah.

4. _____

Chevron has closed eight Detroit stations in the last 60 days. It is rumored it intends to close 20 more.

5. _____

Politicians who are responsible to the voters must involve themselves in basic law enforcement decisions if the fight against crime is to be won, Georgia Public Safety Commissioner Raymond Jones said today. Jones noted that it's the elected representatives of the people who make the laws and determine the level of funds used in law enforcement.

6. _____

This electric hamburger cooker shapes and broils a perfect hamburger in one minute. I bought it on sale yesterday at the new department store. It's the latest of a series of time-saving devices.

SEGMENT 1 - FACT VS. OPINION

ANSWERS TO PRACTICE ITEMS

1. Fact. This statement describes an event that has already taken place.

2. Unsupported opinion. This is a statement of belief without any factual support.

3. Supported opinion. This is a statement of belief backed up by facts.

4. Fact. This is a statement of an event that has occurred.

5. Supported opinion. This conclusion is supported by stated fact.

6. Unsupported opinion. This is a statement of belief without stated factual support.

7. Supported opinion. This is a statement of belief with factual support.

8. Supported opinion. This statement of belief is supported by facts.

9. Fact. This statement describes a condition that may be verified.

Attribute Isolation Feedback (following practice items)

TEST (Teg)

LESSON 7 - FACT VS. OPINION
SELF-CHECK

SEGMENT 1 - FACT VS. OPINION

Classify each of the following underlined statements as fact, supported opinion, or unsupported opinion.

1. _____

New "no frills" flights, which entitle passengers to a seat in the back of the plane without free meals, are an unqualified success. "No frills" attracted more than 74,000 extra passengers, sack lunches and all, to the airline during a 45-day trial period.

2. _____

The two-cent per pound hike in wholesale sugar prices announced by Amstar Corp. and Sucrest Corp. reverses an eight-month decline. One local grocery store manager, who asked to remain anonymous, said he feels that the price increase is due to a false shortage created by sugar refiners.

3. _____

The impurities in the gasoline due to the lack of efficiency in the filtering process in distillation causes potentially harmful sulfides to be emitted.

4. _____

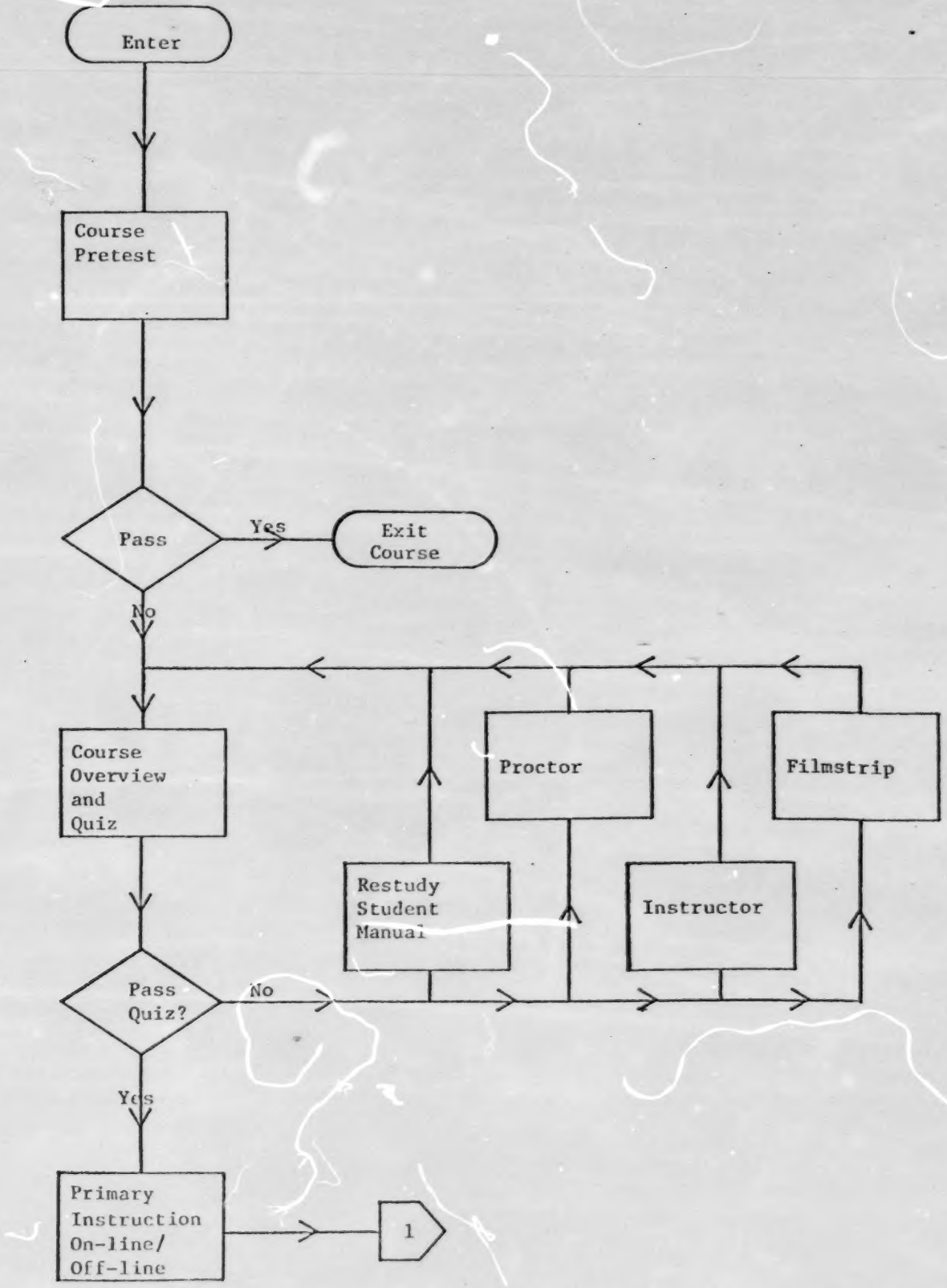
Although the U. of C. table tennis team has an intensive year-round training program of weight lifting, running, swimming, and hours-on-end of practice, beginning players need not get this involved. Table tennis offers more for physical fitness than does jogging, bicycling, back packing, hockey, soccer or other fitness programs.

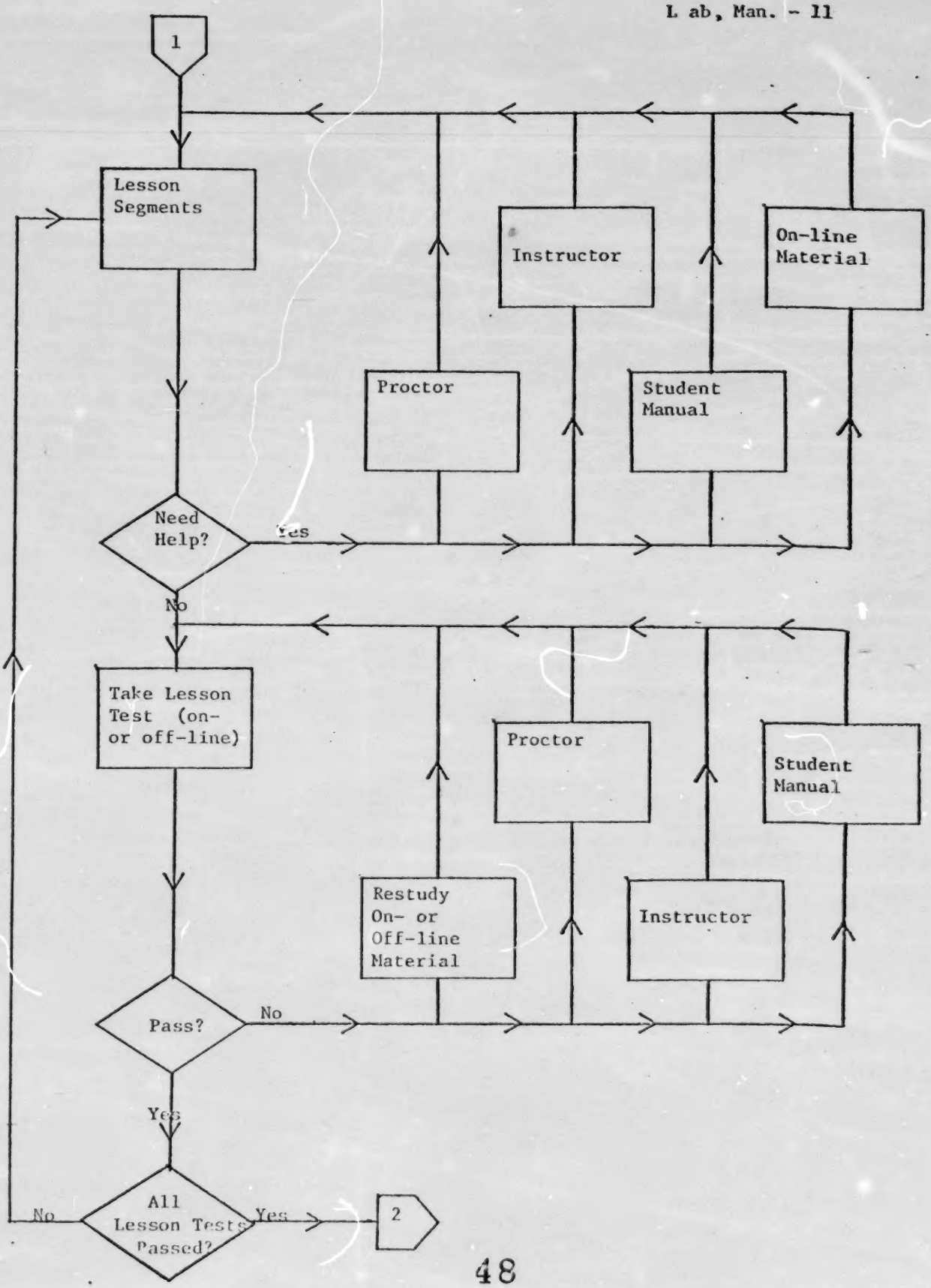
5. _____

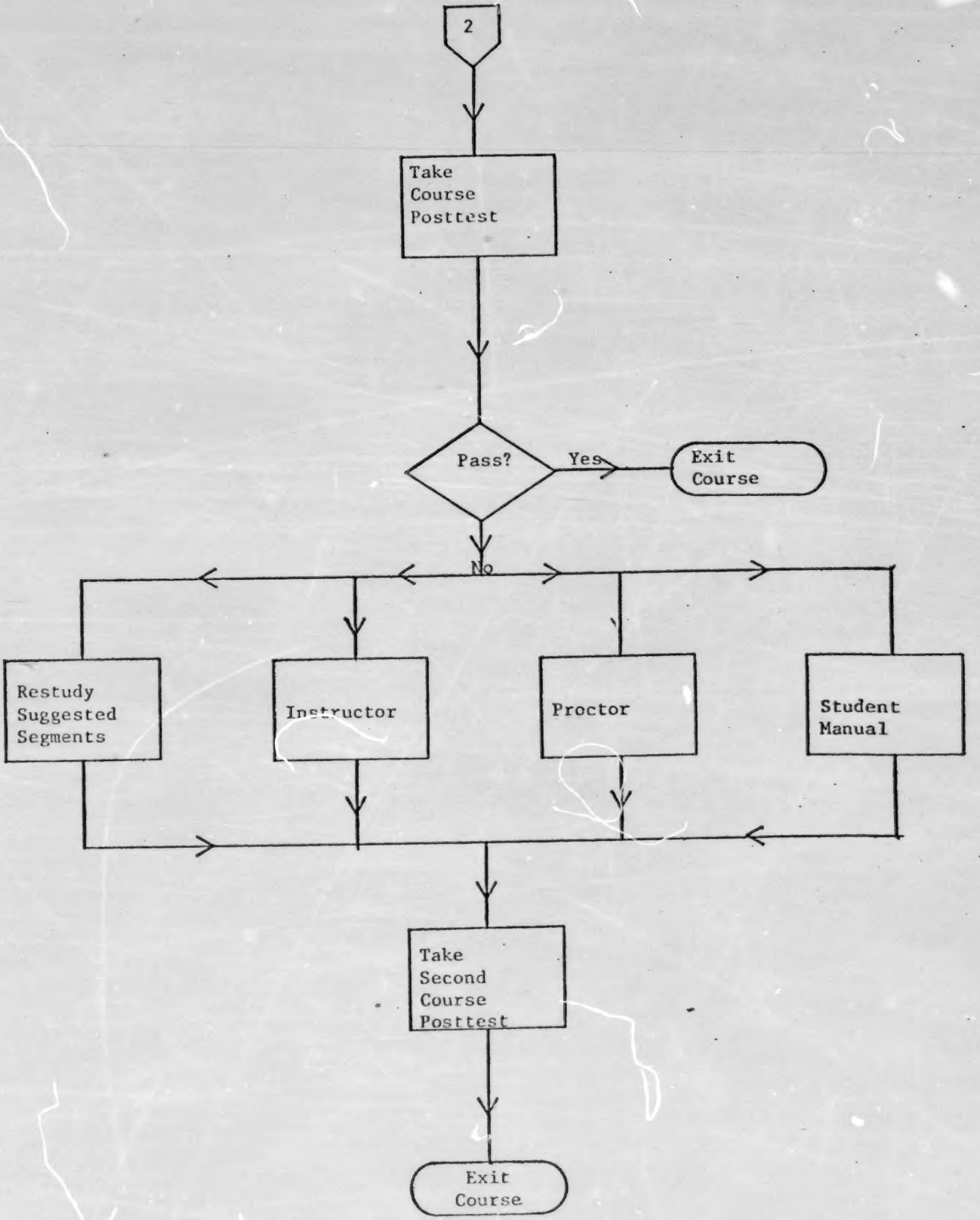
The best time to irrigate a garden or water a lawn is in the morning hours, or up to mid-afternoon. Watering in the evening causes high humidity and creates an ideal environment for fungus if the spores are present.

Appendix B

Figure 2 -
Laboratory Manual

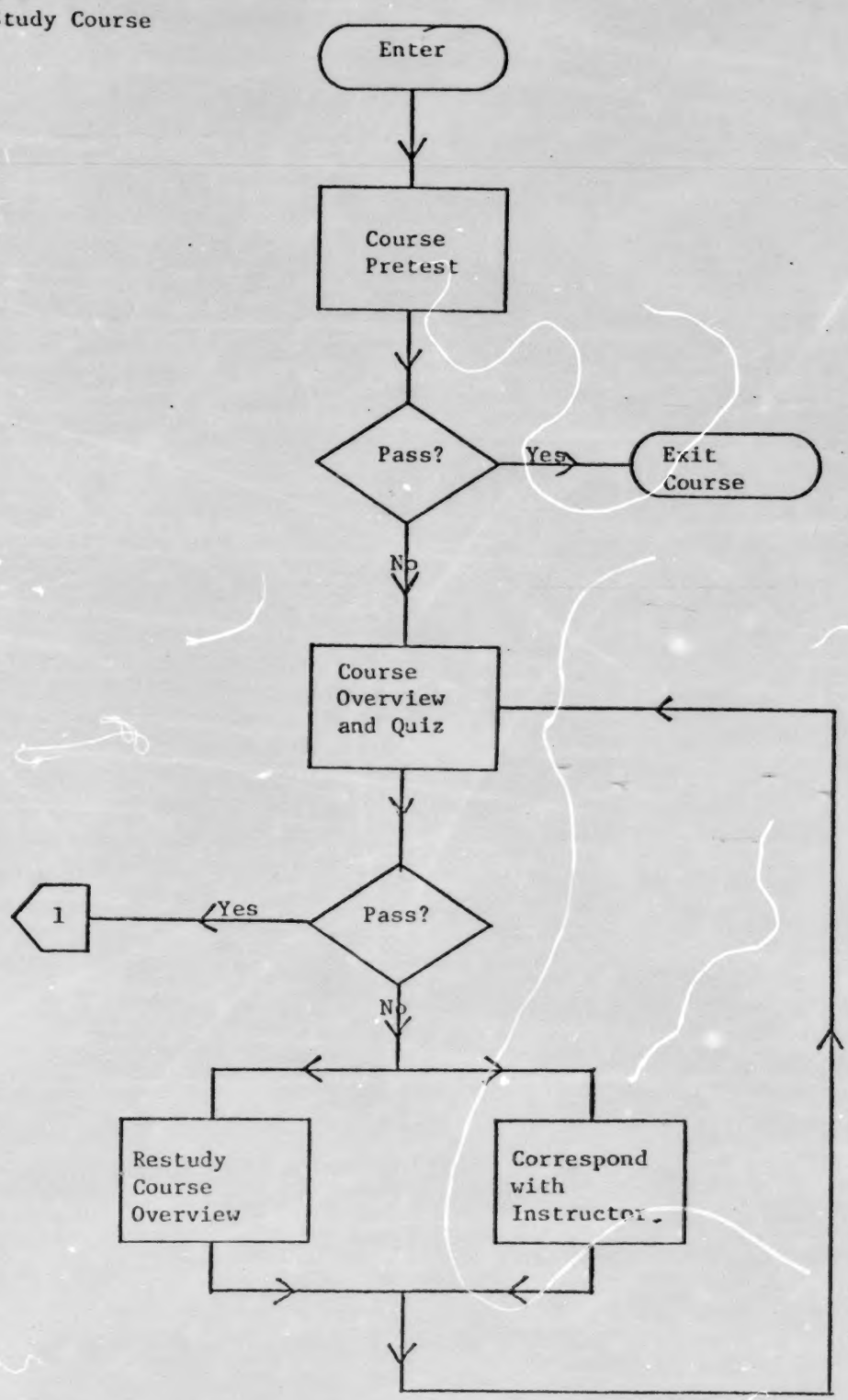


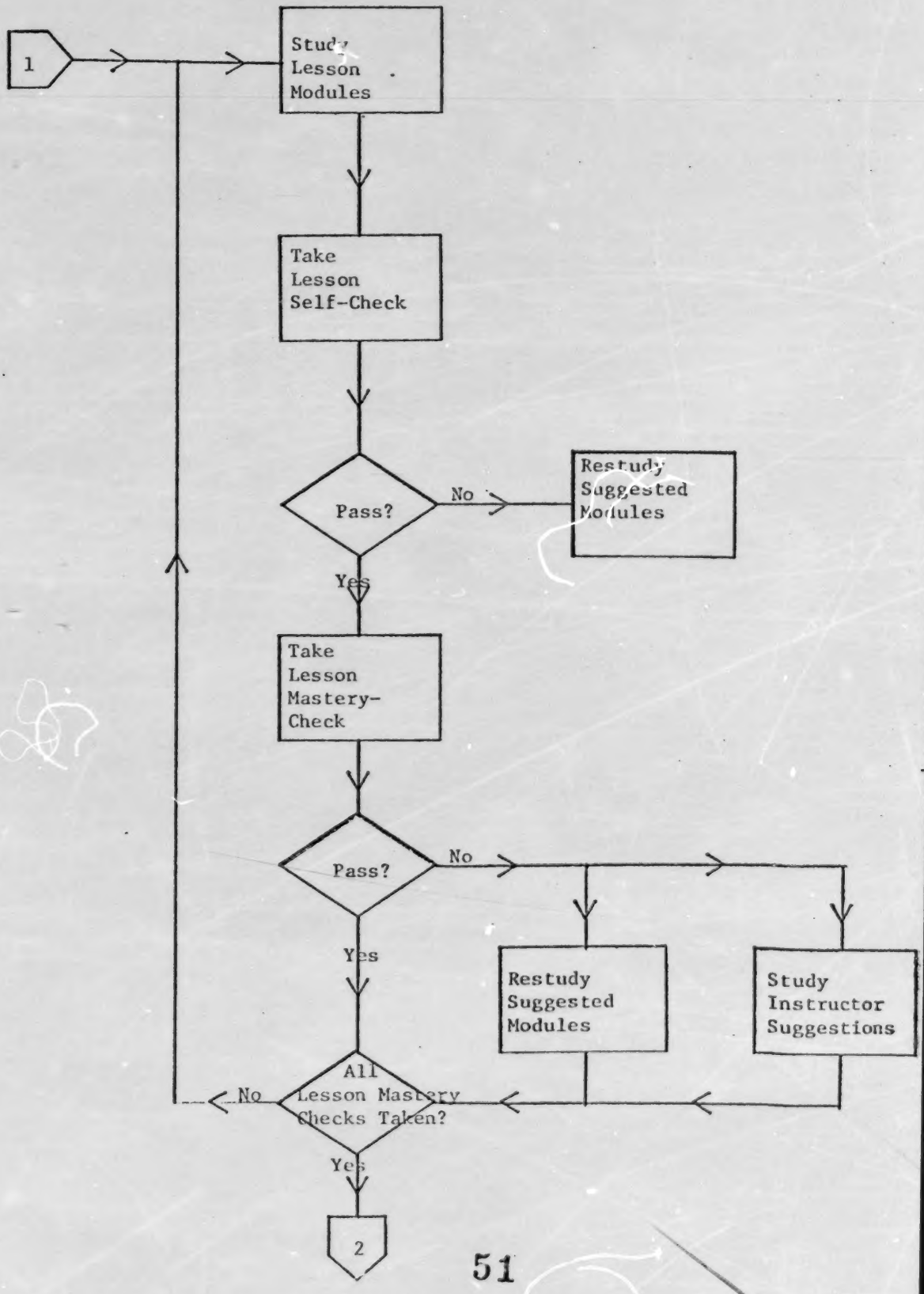

1
Lesson Segments
Instructor
On-line Material
Proctor
Student Manual
Need Help?
Yes
No
Take Lesson Test (on- or off-line)
Proctor
Student Manual
Restudy On- or Off-line Material
Instructor
Pass?
No
Yes
All Lesson Tests Passed?
No
Yes
2

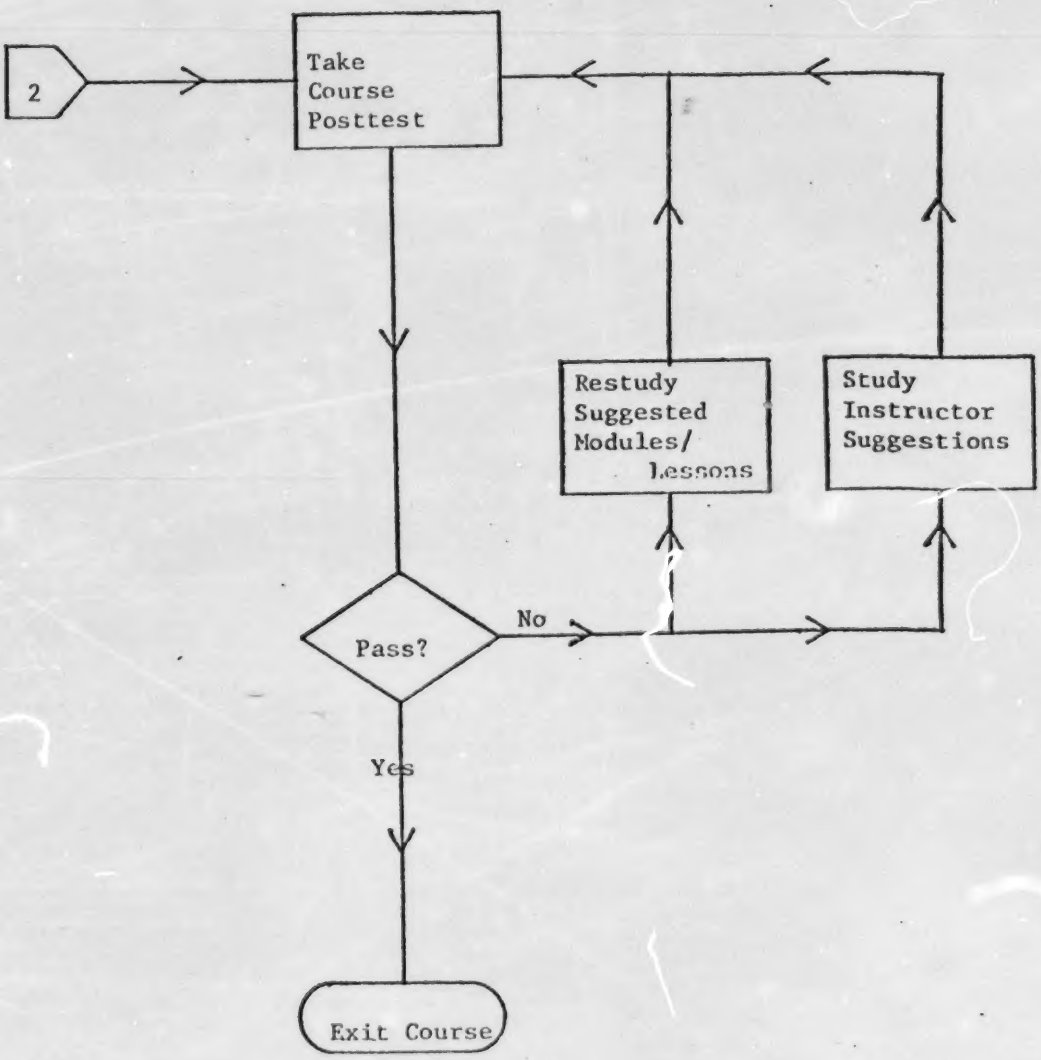

2
Take Course Posttest
Pass?
Yes
Exit Course
No
Restudy Suggested Segments
Instructor
Proctor
Student Manual
Take Second Course Posttest
Exit Course

Appendix C

Figure 2
Home Study Course




1
Study Lesson Modules
Take Lesson Self-Check
Pass?
No
Restudy Suggested Modules
Yes
Take Lesson Mastery-Check
Pass?
No
Yes
Restudy Suggested Modules
Study Instructor Suggestions
All Lesson Mastery Checks Taken?
No
Yes
2


2
Take Course Posttest
Restudy Suggested Modules/ Lessons
Study Instructor Suggestions
Pass?
No
Yes
Exit Course